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Command, Control, and Coordination of the Joint Battlefield Interdiction Area

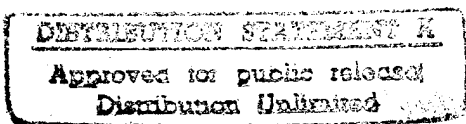
by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.



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Abstract

Command, Control, and Coordination of the Joint Battlefield Interdiction Area

The U.S. military services possess a variety of weapons capable of delivering precision strikes throughout the range of the battlefield from close to long-range attack. Although this has increased the military's capability and flexibility, it has created problems of mission overlap, inefficiency, redundancy, and fratricide, particularly in the battlefield interdiction area (BIA). Joint doctrine and traditional fire support control measures provide sufficient guidance for today's joint battlefield, but do not resolve the dilemma in the BIA. Specifically, who should be responsible for command and control of interdiction missions in the area and how should this be accomplished to optimize joint operations?

Desert Storm revealed interdiction operations in the BIA could have been more efficient. It raised issues of whether traditional fire support coordination measures were still useful on the modern joint battlefield. It also reemphasized the principle of a well-established unity of command to ensure the best chance for success in any operation.

Solutions to problems of command, control, and coordination in the BIA rest with the Joint Force Commander (JFC). Based on the operational situation, he/she must establish a joint command and control structure that maximizes joint interdiction and retains flexibility. A flexible command and control organization, with an interoperable C4I structure, allowing either the ground component commander, air component commander, or other JFC representative to exercise tactical control in the BIA will benefit joint interdiction operations. This, coupled with clearly defined interdiction priorities and guidance from the JFC, will allow all services to pursue their missions with sufficient flexibility and minimal interference from the other services' missions.

Table of Contents

Abstract	ii
Table of Contents.....	iii
Thesis.....	1
Introduction	2
Joint Doctrine and Interdiction.....	3
Joint Doctrine and Fire Support Control Measures	4
Analysis of the Battlefield Interdiction Area During Desert Storm	6
Resolution--JFC and Operational Leadership	10
Conclusion.....	14
Bibliography	15
Endnotes	18

Thesis

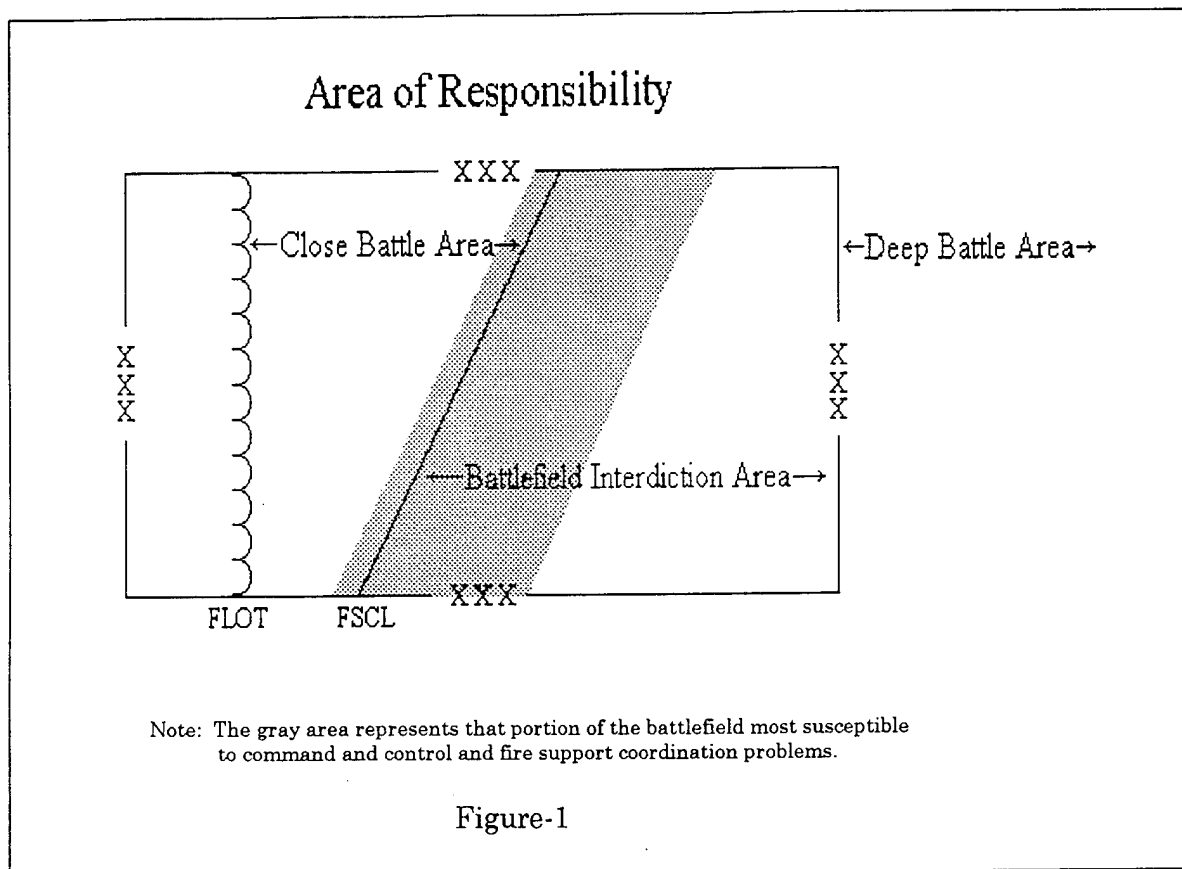
"As the range of weapons currently used to support tactical maneuver increases, they are bound to play a more important role in the delivery of operational fires."¹

Milan Vego

Advances in technology have provided the U.S. military services with a variety of weapons capable of delivering precision strikes throughout the range of the battlefield from close to long-range attack. These weapons have increased the military's capability and flexibility to accomplish operational objectives; however, issues have surfaced regarding the command, control, and coordination, of their employment during joint combat operations.

Mission overlap caused by concurrent weapon use creates potential problems of inefficiency, redundancy, and fratricide throughout the battlefield, but the area most susceptible is the battlefield interdiction area (BIA)(Figure-1).² Two matters must be addressed regarding the BIA: 1) Which service should be responsible for command and control to ensure deconfliction of interdiction missions in the area? 2) How will this be accomplished to allow all services to pursue their missions with sufficient flexibility and minimal interference from the other services' missions?

Joint doctrine and traditional fire support control measures provide sufficient guidance for today's joint battlefield, but do not resolve the dilemma in the BIA. Instead, solutions to problems of command, control, and coordination in the BIA should be left to the Joint Force Commander (JFC). Based on the operational situation, he/she must ensure an interoperable joint command and control structure that allows any component commander or other JFC representative to exercise tactical control in the BIA to maximize joint interdiction.³



Introduction

Each service possesses weapons that can contribute to close air support (CAS), interdiction, air defense, and strategic attack, which has led to overlap in missions and responsibilities.⁴ Prior to Operation Desert Storm, the Air Force provided the primary deep-strike and interdiction capabilities for the U.S. military.⁵ However, Desert Storm showed that the Navy Tomahawk Land-Attack Missile, Army Tactical Missile System (ATACMS), Multiple Launch Rocket System, and attack helicopters could effectively strike into areas historically controlled and attacked by air forces.

For the most part, command and control of deep fires that strike at the enemy's operational to strategic level is not a contentious issue amongst the services. The JFC and subordinate commanders, through a joint target coordination board, can typically

coordinate deep-strike fires during daily planning since service missions do not overlap much in this part of the battlefield. The air commander still provides the bulk of the forces and effort for deep-strike, and few people dispute his/her need to provide command and control of the deep-strike mission. The ground commander has few immediate tactical needs that would necessitate his/her taking command of the deep strategic-strike effort.

On the other end of the battlefield, CAS and fires close to ground forces are clearly within the command and control authority of the ground commander, which joint doctrine supports. Historically, the services have coordinated these missions adequately. However, the BIA between deep strike and CAS has become clouded with issues of interference and inefficiency caused by the concurrent employment and overlap of high tech weapons. (Figure-1). This area has been and may continue to be a weak area of force employment for U.S. armed forces. Joint doctrine provides general guidance for interdiction and coordination of fires in the BIA, but this alone will not provide answers for all situations.

Joint Doctrine and Interdiction

"To have the greatest impact, the planning and conduct of interdiction operations must compliment surface operations. Correspondingly, commanders of surface forces should consider how their capabilities and operations might complement interdiction in achieving the theater campaign objectives."⁶

JP 3-03

Mission overlap caused by today's weapons complicates combat employment for all U.S. armed Forces. The services are increasingly unable to fully prosecute their interdiction operations without considerable cooperation and coordination.

Joint Publication 3-0 states interdiction and maneuver should be regarded as mutually supportive operations aimed at a common enemy to achieve the JFC's objectives.⁷ The interdiction planning process should involve all service components and reflect the JFC's concept of operations. Depending on the situation, the JFC could task his/her staff with the responsibility for planning, coordination, and deconfliction, or he/she could delegate this to a subordinate commander.⁸ Typically, a joint target coordination board is established by the JFC as a central planning group for all interdiction missions. The JFC may place this board under the control of a staff representative or may direct a component commander to orchestrate its efforts. However the JFC organizes the process, it must entail a command and control structure that optimizes the synergistic effect of diverse component capabilities and forces.

Command and control of joint interdiction go beyond the planning phase. It must extend to the employment phase to "ensure a coherent interdiction effort involving diverse forces, under the tactical control of different commanders, using different employment procedures."⁹ The procedures established must minimize redundancy and interference without unduly restricting the operations momentum of the different services. "Certain time-sensitive targets may preclude use of normal coordination procedures. In such cases, pre-coordinated rules of engagement should allow rapid attack of targets of opportunity that arise."¹⁰ "Procedures must be simple and effective; based on the needs of the JFC, and give due consideration to individual service capabilities for speed, range, maneuver, weapon system characteristics, EW ability, and intelligence-gathering."¹¹

Historically, joint operations have relied on long-established fire support measures to assist in the command and control of operations in the BIA. Since some critics argue that these measures may not stand up to today's high-tech, fast-moving military, they merit examination.

Joint Doctrine and Fire Support Control Measures

"Within the joint force theater of operations, all missions must contribute to the accomplishment of the overall objective."¹²

General Colin Powell

In order to facilitate coordination and deconfliction of air and ground missions, the JFC may establish battlefield control by assigning a geographical area of responsibility (AOR) or area of operations (AO) to the ground commander (Figure-1). "Within this boundary the land or naval operational force commander will be designated the supported commander and will be responsible for the synchronization of maneuver, fires, and interdiction through target priority, effects, and timing of interdiction operations."¹³ The JFC determines the position, size, and shape of the boundaries based on numerous considerations including; the campaign plan, an assessment of the overall operational situation, and the specific land commander's maneuver and depth of fire requirements. The boundary is not set in stone and may change during the course of the operation. Synchronization and coordination of efforts within these boundaries are critical.

Within the boundary, the land commander may designate a Fire Support Coordination Line (FSCL)(Figure-1).¹⁴ The overall purpose of this line is to "... protect friendly forces and operations short of the FSCL and to enable subordinate forces and other components to act with minimal coordination in the area beyond the FSCL. Placement of the FSCL is at the discretion of the appropriate land commander, but is typically set based on consultation with the JFC and all affected commanders, the maximum range of U.S. surface-to-surface weapons, and an assessment of the overall operational situation.

According to current joint publications, this is a permissive fire support coordination measure that helps ensure control of fires short of the FSCL, but allows all commanders to strike targets of opportunity beyond the line when necessary, without coordination

with the land commander.¹⁵ Essentially, it establishes a division between the responsibilities of the ground commander on one side and the air commander on the other side. On the friendly side of the FSCL, the ground commander has overall responsibility for air and surface operations to include coordination of all CAS and interdiction missions. All fires, from any of the services, on or short of the FSCL must be coordinated with that specific ground commander. However, "Forces attacking targets beyond the FSCL must inform all other affected commanders in sufficient time to allow necessary reaction to avoid friendly casualties. In exceptional circumstances, the inability to do so will not preclude the attack of targets beyond the FSCL; however, failure to coordinate this type of attack increases the risk of friendly casualties and could waste limited resources through duplicative attack."¹⁶ Regardless of where fires are directed, joint doctrine stresses the desire for as much prior-coordination with all affected commanders as circumstances permit.

Problems arise when a high-valued target of opportunity, beyond the FSCL, presents itself to the ground commander at the same time the air commander plans to carry out an equally important strike in the same area. Joint doctrine can not provide solutions as to which spontaneous mission has priority, which commander should be given the authority to override the other, and how should this be coordinated. Operation Desert Storm offered a number of examples to illustrate the complexity of command and control and fire support coordination of the BIA.

Analysis of the Battlefield Interdiction Area During Desert Storm

Prior to Desert Storm, the FSCL clearly delineated the battlefield between Army control with Air Force support on the near side and Air Force control with Army support on the far side. The ground commander could fire beyond the FSCL if the mission dictated, but with the risk of knowing that it could interfere with Air Force missions.

However, the introduction of high-tech interdiction weapons, the speed at which the ground troops were able to maneuver, and the concentration of numerous allied aircraft all combined to make operational fires beyond the FSCL potentially more lethal to both friendly air and ground forces.

During Desert Storm, General Horner, Joint Force Air Component Commander (JFACC), tried to maximize efficiency beyond the FSCL by cooperating with the ground commanders and stating that if a planned ground target was "... inside the Fire Support Coordination Line, don't bother to tell me. If it's [not], put it in the ATO. Get the air cover; get the ECM support; get the TOT; get the coordination; get all the benefits from being in the ATO."¹⁷ With a FSCL that was repositioned over 200 miles in a 3-day period, this was a complex process to coordinate.¹⁸ The commanders in Desert Storm were able to compromise and work out issues with the FSCL, but they did not eliminate all associated problems of command and control.

Battlefield control, with limitations caused by the FSCL, restrained the Army from carrying out its mission in the most efficient manner. Ground commanders must be able to exploit opportunities, when they arise, to gain the initiative from attacking forces and optimize maneuverability. Ground commanders argued that JFACC control of the BIA hindered army momentum and ground commanders needed to have more authority to control fires in this area. "Although there were procedures for the JFLCC to notify the JFACC when he intended to strike a high payoff target (HPT) beyond the FSCL, the JFACC routinely required more than three hours lead time to ensure all subordinate elements were notified."¹⁹

Brigadier General Creighton Abrams, VII Corps Artillery Commander, stated, "Every fire mission or AH-64 attack beyond the FSCL had to be carefully and painstakingly cleared with the Air Force. Even counterfire required this lengthy process. Equally bad, air sorties beyond the FSCL were completely the domain of the Air Force. VII Corps could nominate targets beyond the FSCL but could never be sure

they would be attacked."²⁰ Moreover, analysis of battlefield interdiction during the ground war showed that it was nearly impossible for the JFACC's staff to track the land force advance, despite efforts to ensure sufficient air-ground coordination.²¹

It would appear a simple solution would be for Army commanders to extend the FSCL to accommodate use of their interdiction weapons. This would allow ground forces complete freedom to employ weapons without the need to coordinate with the air commander. In fact, this did occur in Desert Storm, but with significant consequence. On 27 February 1991, XVIII Airborne Corps wanted to use its Apache helicopters against Iraqi forces on the causeway at Hawr al Hammar which was beyond the FSCL. As a result, the FSCL was extended beyond the causeway, which allowed the helicopters to maneuver against the targets without Air Force coordination. However, it prevented assets under JFACC control from assisting in the attack. Although no U.S. ground forces were in this area at the time, Navy and Air Force aircraft could not attack the causeway unless they were under direct control of forward air controllers (FACs). At that time there were no FACs available since they were being used to support U.S. troops fighting in Kuwait.²² A similar scenario unfolded towards the end of the ground war when VII Corps moved its FSCL 50 miles north of its position, against opposition from the air commanders. Air assets were available but unable to provide interdiction support behind the FSCL, and two Republican Guard Divisions eventually escaped.²³

Extension of the FSCL to the maximum range of Army interdiction weapons also increases the land commander's responsibility and may over-extend the ground force capability to effectively control the AOR. Interestingly, "The safest place for an Iraqi to be was just behind the FSCL," because the Army "could rarely mass air on targets outside of visual range," and the air forces performing battlefield interdiction could not direct fires behind the FSCL without Army coordination and approval.²⁴

When the ground mission is solely considered, extension of the FSCL seems to be a viable option for maximizing combat operations against the enemy. However, the

ground commander who wishes to extend the FSCL to accommodate flexibility for ground forces, may actually compromise the theater-wide operation by limiting opportunities for attack of enemy troops by air forces.

Some critics believe the FSCL is an outdated fire control measure and claim, "definitions and lines on a map that don't allow the flexibility required by nonlinear battle plans should be scrapped."²⁵ Others propose the Air Force interdiction mission be subordinated to support the ground mission in the BIA since this area is still part of the ground commander's AOR. However, the FSCL is still a valid line to partition the battlefield for control and coordination of air assets. Former USAF Chief of Staff, General Merrill McPeak, wrote that Air Force missions and associated control measures, including the FSCL, need not change, and are still flexible enough to accommodate joint effectiveness on the battlefield.²⁶ Recently, the Roles and Mission Commission (RMC) not only recommended the continued use of the FSCL, but recommended that it change from a permissive to a restrictive measure. This would restrict ground commanders from attacking beyond the FSCL without JFACC approval. The RMC also advocated using the FSCL as the forward boundary of the ground commander's responsibility in order to simplify the JFACC's control of deep operations (The RMC defined anything beyond close air support as deep operations, including the BIA).²⁷

There continues to be debate over whether the JFACC or the Joint Force Land Component Commander (JFLCC) should be given authority for command and control in the BIA. During the Gulf War, ground commanders wanted "each corps, not JFACC, to have responsibility for shaping the battlefield through air interdiction both prior to and after G day."²⁸ With the JFACC in control of battlefield interdiction beyond the FSCL, ground commanders complained about their inability to control air attacks against Iraqi forces, and the Air Force was not hitting the targets the ground commanders selected.²⁹ Ground commanders nominated more than 2000 targets for the Air Force to strike and

the Air Force attacked only 300 (15 percent).³⁰ Poor weather conditions adversely affected air interdiction missions, which were less successful than Air Force expectations. There is also evidence ground commanders did not coordinate their targets sufficiently through the Air Tasking Order used by allied forces.³¹ However, the main reason only 300 targets were attacked was General Schwarzkopf determined where allied forces would focus their interdiction missions. He directed the JFACC to concentrate interdiction sorties against the Republican Guard and stated to all service component commanders, "Guys, it's all mine, and I will put it where it needs to be put."³²

Although the Air Force was not specifically at blame for these interdiction statistics, the question of whether the JFACC is the most appropriate commander to control the BIA remains valid. Ground maneuver and weapons employment were restricted by higher priority air missions during Desert Storm. Even though the operation was an overall success it should not be used as a checklist for conducting future interdiction operations.

Resolution--JFC and Operational Leadership

There will always be tradeoffs when selecting and attacking interdiction targets when finite resources are available. Regardless of what command and control structure is established for battlefield management, Army-preferred targets are bound to conflict with the Air Force and vice versa. Ultimately, it is not an Army and Air Force issue, but a joint operations issue. The key is to minimize detrimental effects of coordination on the battlefield to ensure joint unity of effort.

Prioritization and deconfliction for most targeting conflicts amongst the services can usually be ironed out during planning for interdiction. The JFC establishes interdiction priorities, targeting guidance, and apportions assets to be used based on inputs from the

subordinate commanders. Any conflicts amongst the services are typically resolved through the JFC.³³ However, plans must adapt to the operation as it unfolds on the battlefield. On a daily basis numerous targets of opportunity in the BIA may present themselves to air and ground forces. Obviously, the JFC can not orchestrate all developments on the battlefield continuously. For this reason, it is important that a single unity of command be developed to ensure that the JFC's priorities are met on the battlefield. Eventually, a single component commander or other JFC representative must be used to make decisions on behalf of the JFC that conform to his/her concept of operations.

To ensure unity of effort in the BIA, many people propose establishing the JFLCC as overall authority for interdiction missions. Others advocate the JFACC. Both of these choices offer merit, but both have limitations. Although all of the services present logical arguments for their need to maintain control of the battlefield, there are no clear-cut answers that will suffice for all joint operations.

Another viewpoint is, "The component commander controlling the preponderance of responsive weapon systems used for battle interdiction should be the overall coordinator."³⁴ The ATACMS and Apache helicopters are responsive, but to make the ground commander responsible for control of the BIA on this alone would neglect other operational considerations. Battlefield interdiction is just a small piece of the overall theater mission. When determining command and control of the battlefield, one must consider that Navy and Air Force air power is available to support all theater forces and missions including, theater missile defense, strategic attack, airborne reconnaissance, and airspace management.

The solutions lie in operational art; primarily on the leadership skills and operational design of the JFC. The JFC's operational design must include the proper tools that foster effective interdiction: "accurate and timely intelligence, freedom of action, ability to detect and identify targets, sustained pressure, concentration,

channelization, high rates of consumption, logistic constriction, time-urgent movement, and effective C3."³⁵ He/she must establish an interoperable C4I structure that can provide sufficient information and resources to all component commanders to allow any of them to orchestrate the JFC's concept of operations on the battlefield. This may seem obvious, but joint C4I was not sufficiently established during Desert Storm. For example, Navy equipment and procedures were not completely compatible with the Air Force Air Tasking Order system used to coordinate the use of allied air assets. This initially complicated coordination of air sorties until an ad hoc system was established.

Today, joint doctrine and inter-service cooperation have resulted in continual improvements in joint C4I on the battlefield. One example is the Army's recently developed Advanced Field Artillery Tactical Data System that allows the ground commander to automatically coordinate and deconflict all fire support requests throughout the battlefield. This allows the commander to deconflict with JFACC missions while engaging targets in minimum time. It does not mean, however, that the ground mission should have priority over the air mission.

When determining which component commander should be given authority for control in the BIA, the JFC must contemplate the operation as a whole. The same factors the JFC analyzes to form the commander's estimate should also be analyzed for establishing command and control in the BIA. Ultimately, control of interdiction missions in the BIA should be dependent on the situation and circumstances surrounding the overall operation.

Based on thorough analysis, the JFC can determine the best method for application of interdiction for the specific operation. A thorough examination of the myriad of factors that could influence the JFC's decisions is beyond the scope of this paper. However, selected examples will illustrate the point. For instance, terrain and geography can have an adverse affect on ground or air interdiction missions. Muddy or mountainous terrain could impede the ground forces' capability to maneuver and deliver

interdiction strikes as quickly as the JFC would prefer. Although mountainous terrain can degrade the radar capability of the JFACC's air assets, he/she might be better poised to orchestrate interdiction missions within the BIA in this particular situation.

In another situation, seasonal adverse weather in the form of low ceilings or fog could have a detrimental effect on the air forces' ability to launch and employ interdiction assets. In this case, Army or Marine interdiction assets may be able to perform with little or no mission degradation.

Weapon system reliability, performance, and accuracy could also shape the JFC's decision on command and control of interdiction. During the operation, analysis may indicate certain forces are able to accomplish interdiction strikes more effectively than others. This might warrant increased priority for those missions. The JFC could extend BIA control to the associated component commander in order to prosecute the interdiction mission to the fullest extent possible. During Desert Storm, air assets had difficulty locating and destroying Scud launchers. However, ATACMS because of its ability to quickly locate and fire was more effective. Since the air forces had attained air supremacy in the theater, a significant portion of their sorties was dedicated to interdiction in support of the ground forces. Armed with capable weapons that could strike at interdiction targets of their choosing in minimum time, ground commanders could have been given command and control of the BIA, and allied efforts might have been more effective.

The command and control structure must be flexible to ensure the joint force can adapt as priority changes in the operation develop. At any time, the JFC may determine the air mission has priority over the ground mission and vice versa. There may be a point in the operation that the JFC determines the air mission for strategic strike, suppression of enemy air defenses, and interdiction will have priority over the ground forces' preference to maneuver. During the first phase of Desert Storm, General Schwarzkopf determined air superiority and strategic attack were at the top of the

priority list. Based on that specific situation, the JFACC was clearly a logical choice for control of the BIA. On the other hand, once air supremacy was established and the ground war became a priority, there was less need for the JFACC to maintain overall authority of the BIA. The ground commander could have been given more authority to ensure that his/her targets of opportunity could be attacked without permission from the JFACC.

Certainly a well-established C4I structure could have provided the necessary deconfliction and coordination regardless of which commander had ultimate authority. Allowing the ground commander to pursue the ground campaign in the BIA knowing that he/she had ultimate authority may have augmented the ground efforts. With air supremacy well in hand, the JFACC was in a better position to curtail some of his missions to ensure the ground commander had full leeway to conduct the ground war as he deemed appropriate. In either case, the commander with authority can weigh the needs and desires of the other commanders and make appropriate decisions. It gives the commander with the higher priority mission the authority to ensure that his/her selected targets are attacked. This kind of C4I structure will allow the joint force to adapt to changes in the JFC's concept of operations. It provides maximum flexibility for the JFC to pursue operational objectives.

Conclusion

As the U. S. military continues to improve its joint employment capabilities, the individual services continue to compromise aspects of their own missions for the benefit of the overall operation. Military commanders during Desert Storm used team work and coordination to resolve interdiction problems and optimize combat employment in the BIA. Desert Storm showed interdiction operations could have been improved upon, and future operations may not be easily coordinated and conducted. It reemphasized

the need for a well-established unity of command to ensure the best chance for success in an operation.

The BIA is only a small portion of the battlefield, but it serves as an excellent illustration for the complexities of joint operations. The question of which service should be responsible for command and control to ensure deconfliction of interdiction missions in the BIA is best answered by analyzing the specific operation. The JFC is in the best position to determine how he/she wishes to conduct this process and should be afforded the flexibility to establish command and control accordingly. A flexible command and control organization, with an interoperable C4I structure, allowing either the JFLCC, JFACC, or other JFC representative to exercise tactical control in the BIA will benefit the entire operation. This, coupled with clearly defined interdiction priorities and guidance from the JFC, will allow all services to pursue their missions efficiently with minimal interference from the other services' missions.

Endnotes

- ¹ NWC 4025, p. 19.
- ² Battlefield interdiction area: That portion of the battlefield beyond the fire support coordination line out to the boundary that defines the ground commander's area of responsibility. Beyond the battlefield interdiction area is the deep battle area.
- ³ Although the issues discussed in this paper do apply to the Navy and Marine components, it is the Army and Air Force that must contend with the preponderance of issues dealing with the BIA. For simplification, during the remainder of the paper, mention of the JFLCC, ground commander, or land commander will imply the Joint Force Maritime Commander as well.
- ⁴ "Interdiction: An action to divert, disrupt, delay or destroy the enemy's surface military potential before it can be used effectively against friendly forces." (Joint Pub 3-0, p. GL-7).
- ⁵ Branches of military services mentioned in in this paper refer to those of the United States.
- ⁶ JP 3-03T, p. II-2.
- ⁷ JP 3-0, p. IV 13.
- ⁸ JP 3-03T, p. IV-2.
- ⁹ Ibid, p. IV-4.
- ¹⁰ Ibid, p. IV-4.
- ¹¹ Ibid, p. IV-4.
- ¹² JP 3-0, p. 16.
- ¹³ Ibid, p. 16.
- ¹⁴ Joint Pub 3-0, p. GL-7 defines the fire support coordination line as "a line established by the appropriate land or amphibious force commander to ensure coordination of fire not under the commander's control but which may affect current tactical operations. The fire support coordination line is used to coordinate fires of air, ground, or sea weapons systems using any type of ammunition against surface targets. The fire support coordination line should follow well-defined terrain features. The establishment of the fire support coordination line must be coordinated with the appropriate tactical air commander and other supporting elements. Supporting elements may attack targets forward of the fire support coordination line without prior coordination with the land or amphibious force commander provided the attack will not produce adverse surface effects on or to the rear of the line. Attacks against surface targets behind this line must be coordinated with the appropriate land or amphibious force commander. Also called FSCL."
- ¹⁵ JP 1-02.
- ¹⁶ Ibid
- ¹⁷ General Chuck Horner quoted in GWAPS Vol 1, Part II, p. 64.
- ¹⁸ GWAPS Vol 2, Part II, p. 259. The XVIII Corps FSCL moved more than 200 miles in 3 days.
- ¹⁹ Vozzo, p. 40.
- ²⁰ Eshelman, p. 25.
- ²¹ GWAPS Vol 1, Part II, p. 65.
- ²² GWAPS Vol 2, Part I, p. 315. Preceding 5 sentences paraphrased from GWAPS.
- ²³ Lewis, p. 15.
- ²⁴ GWAPS Vol 2, Part II, p. 257.
- ²⁵ Fawcett, p. 23.
- ²⁶ McPeak, p. 71.
- ²⁷ Gordon, p. 8
- ²⁸ Lewis, p. 16.
- ²⁹ GWAPS Vol 1, Part II, p. 60.
- ³⁰ GWAPS Vol 2, Part I, p. 284.
- ³¹ Lewis, p. 18.
- ³² GWAPS Vol 1, Part II, p. 60.
- ³³ JP 3-03T, p. IV-2.
- ³⁴ Vozzo, p. 44.
- ³⁵ JP 3-03T, p. III-1.

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